

1 WHAT IS CLAIMED IS:

- 2
- 3 1. A process for removing contaminants from the products of a
- 4 Fischer-Tropsch synthesis reaction, said contaminants comprising
- 5 (i) particulates having an effective diameter of greater than 1 micron
- 6 and (ii) at least 5 ppm of aluminum in aluminum-containing
- 7 contaminants having an effective diameter of less than 1 micron,
- 8 said process comprising the steps of:
- 9
- 10 (a) passing the products of the Fischer-Tropsch synthesis reaction
- 11 through a first particulate removal zone capable of removing
- 12 particulates having an effective diameter of greater than
- 13 1 micron;
- 14
- 15 (b) collecting from the first particulate removal zone a substantially
- 16 particulate free Fischer-Tropsch feed stream containing 5 ppm
- 17 or more of aluminum in aluminum containing-contaminants
- 18 having an effective diameter of less than about 1 micron;
- 19
- 20 (c) contacting the substantially particulate free Fischer-Tropsch
- 21 feed stream in up-flow mode with an aluminum active catalyst in
- 22 a guard-bed under aluminum activating conditions, whereby a
- 23 feed stream mixture is formed which comprises
- 24 aluminum-containing particles having an effective diameter of
- 25 more than 1 micron in a Fischer-Tropsch hydrocarbon
- 26 continuous phase;
- 27
- 28 (d) passing the feed stream mixture through a second particulate
- 29 removal zone capable of removing substantially all of the
- 30 aluminum-containing particles formed in step (c); and

- 1 (e) recovering from the second particulate removal zone a
2 Fischer-Tropsch product containing less than about 5 ppm total
3 aluminum.
- 4
- 5 2. The process of claim 1 wherein the aluminum active catalyst comprises
6 at least one active Group VI metal and at least one active Group VIII
7 base metal on an oxide matrix.
- 8
- 9 3. The process of claim 2 wherein the Group VI metal is selected from the
10 group consisting of chromium, molybdenum, and tungsten.
- 11
- 12 4. The process of claim 2 wherein the Group VI base metal is selected
13 from the group consisting of nickel and cobalt.
- 14
- 15 5. The process of claim 1 wherein the temperature in the guard-bed is
16 maintained at about 550 degrees F or higher.
- 17
- 18 6. The process of claim 5 wherein the temperature in the guard-bed is
19 maintained at about 600 degrees F or higher.
- 20
- 21 7. The process of claim 6 wherein the temperature in the guard-bed is
22 maintained at about 650 degrees F or higher.
- 23
- 24 8. The process of claim 1 wherein the LHSV in the guard-bed is about
25 1 or greater.
- 26
- 27 9. The process of claim 1 wherein the particulates are removed in the first
28 particulate removal zone by filtration.
- 29
- 30 10. The process of claim 1 wherein the particulates are removed in the first
31 particulate removal zone by centrifugation.

- 1 11. The process of claim 1 wherein in the second particulate removal zone
2 the aluminum-containing particles having an effective diameter of
3 1 micron or greater are removed by filtration.
4
- 5 12. The process of claim 1 wherein in the second particulate removal zone
6 the aluminum-containing particles having an effective diameter of
7 1 micron or greater are removed by centrifugation.
8
- 9 13. The process of claim 1 wherein in the second particulate removal zone
10 the particulates are removed by distilling the feed stream mixture
11 recovered in step (d) into the Fischer-Tropsch product of step (e) and a
12 bottoms fraction which contains the aluminum-containing particulates.
13
- 14 14. The process of claim 1 wherein the Fischer-Tropsch product recovered
15 in step (e) contains less than about 2 ppm total aluminum.
16
- 17 15. The process of claim 1 wherein the Fischer-Tropsch product recovered
18 in step (e) contains less than about 1 ppm total aluminum.
19
- 20 16. The process of claim 1 wherein the substantially particulate free
21 Fischer-Tropsch feed stream collected in step (b) contains less than
22 0.1 weight percent particulates having an effective diameter of greater
23 than 1 micron.
24
- 25 17. The process of claim 1 wherein the Fischer-Tropsch feed stream of
26 step (b) comprises Fischer-Tropsch wax.
27
- 28 18. The process of claim 1 wherein the Fischer-Tropsch feed stream of
29 step (b) comprises condensate and Fischer-Tropsch wax.
30
- 31 19. The process of claim 1 wherein the products of the Fischer-Tropsch
32 synthesis are produced in a slurry-type Fischer-Tropsch reactor.

1 20. The process of claim 1 wherein the guard-bed is operated as an
2 up-flow fixed bed.

3

4 21. The process of claim 1 wherein the guard-bed is operated as an
5 ebullating bed.

6

7 22. A process for removing contaminants from the products of a
8 Fischer-Tropsch synthesis reaction, said contaminants comprising
9 (i) particulates having an effective diameter of greater than 1 micron
10 and (ii) at least 5 ppm of aluminum in aluminum-containing
11 contaminants having an effective diameter of less than 1 micron, said
12 process comprising the steps of:

13

14 (a) separating the Fischer-Tropsch products into a wax fraction and
15 a condensate fraction;

16

17 (b) passing the wax fraction through a first particulate removal zone
18 capable of removing particulates having an effective diameter of
19 greater than 1 micron;

20

21 (c) collecting from the first particulate removal zone a substantially
22 particulate free Fischer-Tropsch wax stream containing 5 ppm or
23 more of aluminum in aluminum containing-contaminants having
24 an effective diameter of less than about 1 micron;

25

26 (d) contacting the substantially particulate free Fischer-Tropsch wax
27 stream in up-flow mode with an aluminum active catalyst in the
28 presence of hydrogen in a fixed guard-bed at a temperature of
29 at least 600 degrees F and a LHSV of about 1.0 or higher,
30 whereby a mixture is formed which comprises
31 aluminum-containing particles having an effective diameter of
32 more than 1 micron in a Fischer-Tropsch waxy hydrocarbon
33 continuous phase;

- 1 (e) passing the mixture through a second particulate removal zone
- 2 capable of removing substantially all of the aluminum-containing
- 3 particles formed in step (d); and
- 4
- 5 (f) recovering from the second particulate removal zone a
- 6 Fischer-Tropsch product containing 1 ppm or less of total
- 7 aluminum.